REMARKS

Claims 1-26 are pending in this application.

Claim 14 is amended to correct a typographical error. Claims 11-12 and 23-24 are amended to clarify certain claim dependencies. Claims 25 and 26 are added also to clarify certain claim dependencies. Support for the amendments is found the specification, for example, in Fig. 2. No new matter is added.

Applicants request reconsideration of the pending claims in light of the following claim amendments remarks.

Claim Objection

Claims 11-12 and 23-24 were objected to for vagueness, as the March 17, 2005 Office Action (hereinafter, Office Action) urged that the "... third main process gases..." is mentioned in claims 11-12 and 23-24, but there is lacking "...second main process gases..." in any previous base claims. (see, Office Action, at top of page 2).

Responsive to the Examiner's claim objections, applicants have amended claims 11-12 and 22-23 so that all of these claims now refer to the "second main process gases". Also, claims 25-26 are added to provide for proper dependency.

Accordingly, with the amendment to claims 11-12 and 23-24, and addition of claims 25-26, applicants respectfully request that the objected to claims 11-12 and 23-24 be reconsidered and withdrawn.

Claim Rejection under 35 U.S.C. §103

Claims 1 and 4-24 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,846,745 to Papasouliotis et al (hereinafter, Papasouliotis). The Office Action urged that Papasouliotis teaches the high-density plasma process steps as in the claims of the present invention. (see, Office Action, at pages 2 bridging page 3).

The Office Action provides that Papasouliotis teaches a high density plasma CVD process comprising the steps of: preparing a semiconductor substrate, loading the semiconductor substrate into a process chamber; and injecting first main process gases including a silicon source gas (col. 6, line 41-67), an oxygen gas (col. 7, lines 1-8), with silicon tetrafluoride (SiF_4) also acted as a nitrogen free chemical etching gas (col. 7, lines 14-15; Abstract; col. 9, lines 1-19), a

hydrogen gas (col. 6, lines 50-55; col. 9, lines 45-61; col. 15, lines 5-34), and a helium gas (re claim 13; col. 6, lines 49-51; col. 16, lines 1-3; col. 7, lines 16-21) into the process chamber to generate a high density plasma over the semiconductor substrate and to simultaneously form a silicon oxide layer in the semiconductor substrate (Figs. 2A-2B, col. 6, lines 9 through col. 8), wherein the semiconductor substrate is heated to a temperature in a range of about 480 °C to about 650 °C (col. 8, line 13). (see, Office Action, page 2 bridging page 3).

Applicants respectfully traverse this rejection.

The motivation to modify the prior art must flow from some teaching in the art that suggests the desirability or incentive to make the modification needed to arrive at the claimed invention. There is no such teaching in Papasouliotis.

In particular, Papasouliotis discloses a method of filling gaps on a semiconductor substrate comprising (a) providing a substrate in a process chamber of a chemical vapor deposition reactor; (b) depositing a dielectric layer that partially fills the gaps; (c) etching the dielectric layer with a plasma containing a fluorine-containing species; (d) using a high-density plasma obtained using a molecular hydrogen containing process gas; and (e) depositing additional dielectric on the semiconductor substrate, using a high-density plasma (see, Papasouliotis, at col. 2, lines 38-47 and claim 1).

Although Papasouliotis suggests use of the individual gases in various processes, Papasouliotis does not teach or suggest using various gases as part of the first main process gases as in claims 1 and 13 of the present invention, *inter alia*, *a* process step of injecting the first main process gases including a silicon source gas, an oxygen gas, a nitrogen free chemical etching gas and a hydrogen gas. For example, in the deposition step (b), Papasouliotis employs a fluorine-containing species to improve gap fill and hydrogen to scavenge away fluorine in the deposited layer (see, Papasouliotis at col. 3, line 67-col. 4, line 2). Then, in a *separate* etching step (c), Papasouliotis employs a plasma-containing fluorine species originating from a fluorine-containing process gas (see, Papasouliotis at col. 4, lines 55-62). Subsequently, in a *separate* passivation step (d), Papasouliotis employs a plasma generated from a hydrogen-containing process gas in order to scavenge much of the fluorine remaining in the dielectric after the etch operation (see, Papasouliotis at col. 4, line 66-col. 5, line 4). Finally, in a *separate* second deposition step (e), Papasouliotis employs an identical or nearly identical process condition as that in step (b) (see, Papasouliotis, at col. 5, lines 12-15).

Thus, even if some of the gases recited in claims 1 and 13 were substituted in the steps above, the resulting plasma would have characteristics which are much different as injecting first main process gases including a silicon source gas, an oxygen gas, a nitrogen free chemical etching gas and a hydrogen gas into the reaction chamber to generate a high density plasma over the semiconductor substrate and to simultaneously form a silicone oxide layer on the semiconductor substrate as in claims 1 and 13 of the present invention. Further, as correctly noted by the Examiner, Papasouliotis does not disclose heating the substrate at "about 550°C to about 700°C", as further claimed in claims 1 and 13 of the present application.

Accordingly, claims 1 and 13 are not rendered obvious in view of Papasouliotis. Applicants respectfully request reconsideration and withdrawal of the rejection to claims 1 and 13, and claims 4-12 and 14-24 depended respectively therefrom.

Claims 2-3 were rejected under 35 U.S.C. §103(a) as being unpatentable over Papasouliotis taken with U.S. Patent No. 5,753,044 to Hanawa et al (hereinafter, Hanawa) The Office Action urged that Hanawa teaches a high plasma density apparatus, wherein high density plasma is generated by applying a plasma power to an induction coil (18,60') installed outside the chamber as to increase the plasma ion density uniformity across the wafer surface, and that the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a high plasma density CVD reactor for depositing the silicon oxide layer of Papsouliotis by employing the high plasma density apparatus having the induction coil installed outside the chamber, as taught by Hawana. (see, Office Action, at pages 4). Applicants respectfully traverse this rejection.

Applicants submit that Papasouliotis taken with Hanawa still does not render obvious claims 2 and 3 of the present invention.

As discussed above, Papasouliotis does not teach or suggest the process step of injecting the first main process gases including a silicon source gas, an oxygen gas, a nitrogen free chemical etching gas and a hydrogen gas as in claim 1. Hawana, which is only directed to a plasma reactor, does not cure the deficiency of Papasouliotis with regard to the process step of injecting the first main process gases including a silicon source gas, an oxygen gas, a nitrogen free chemical etching gas and a hydrogen gas as in claim 1. Based on the above, independent

claim 1 is patentable over Papasouliotis taken with Hanawa. Since claims 2-3 are dependent on claim 1, claims 2-3 are also patentable.

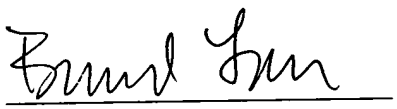
Accordingly, applicants respectfully request reconsideration and withdrawal of the rejection to claims 2-3 under 35 U.S.C. §103(a) as being unpatentable over Papasouliotis taken with Hanawa.

Conclusion:

In summary, applicants respectfully submit that the instant application is in condition for allowance. Early notice to that end is earnestly solicited.

If a telephone conference would be of assistance in furthering prosecution of the subject application, applicant requests that the undersigned be contacted at the number below.

Respectfully submitted,



Bernard Lau
Reg. No. 38,218
Attorney for Applicants

F. Chau & Associates, LLC
130 Woodbury Road
Woodbury, NY 11797
Tel: (516) 692-8888
Fax: (516) 692-8889